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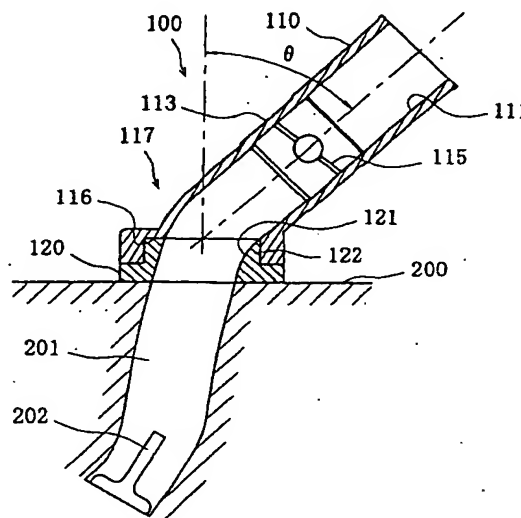
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(54) **INTERNAL COMBUSTION ENGINE INTAKE AIR PASSAGEWAY MEMBER**

(57) It is an object of the present invention to provide an intake passage member that can be formed by die casting or injection molding of a synthetic resin which allows the removal of cores from the mold without destruction of the cores even in cases where there is a bent part in the intake passage. The present invention provides an intake passage member for an internal combustion engine comprising a throttle body (intake passage main body part) which has an intake passage that has a bent part, and an insulator which is interposed between the abovementioned intake passage main body part and the internal combustion engine, wherein the intake passage of the abovementioned insulator is extended in the direction in which the intake air flows through, a portion of the bent part of the abovementioned intake passage is formed in the intake passage of the insulator, and the intake passages of both the intake passage main body part and insulator are formed with shapes that allow cores to be removed from the mold. Since the cores can be removed from the mold without destroying the cores, the intake passage member can be manufactured by die casting or injection molding of a synthetic resin.

FIG.1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an intake passage member such as a throttle body, carburetor, intake pipe or the like which feeds intake air or a mixture to the intake valves of an internal combustion engine.

Description of the Related Art

[0002] Fig. 5 is a sectional view which shows a conventional intake passage member 10 attached to the cylinder head or the like of an engine 200. Here, the term "intake passage member" refers to a member that combines a carburetor, throttle body or intake pipe with an insulator. Furthermore, such a carburetor, throttle body, intake pipe or the like will be referred to here as the "intake passage main body part".

[0003] The intake passage member 10 shown in Fig. 5 uses a throttle body 11 as the intake passage main body part. The insulator 12 is used for heat insulation, and is ordinarily made of bakelite. The throttle body 11 has a bent intake passage 13 inside. The throttle body 11 is fastened to the engine 200 via the insulator 12 by means of bolts or the like (not shown in the figures). The intake passage 13 communicates with an intake passage 201 formed on the side of the engine 200, and intake air is intermittently fed into the cylinders by the opening and closing of a valve 202 located at the end of the intake passage 201.

[0004] There may be cases in which a bent part 15 is present in the intake passage 13 as shown in the figures. The reason for this is that it may be necessary because of local restrictions to incline the intake passage by an angle of θ when the intake passage member 10 is attached to the engine 200.

[0005] Conventionally, throttle bodies 11 used as intake passage parts have mainly been manufactured by the die casting of aluminum alloys. Recently, however, throttle bodies made of synthetic resins have begun to be used. In either case, a manufacturing method based on injection molding is used. In the case of injection molding, the intake passage 13 can be formed by inserting a core in the area of the intake passage 13, and removing this core from the mold following injection molding.

[0006] However, if there is a bent part 15 in the intake passage, an area S exists in which the core cannot be removed from either end. Conventionally, the throttle body 11 has been manufactured by casting in such cases. The reason for this is as follows: in the case of casting, the core is formed by sand; accordingly, the core can be removed from the bent part 15 by destroying the core.

[0007] However, if the throttle body 11 is manufac-

tured by casting, there is a conspicuous drop in the manufacturing efficiency; i. e., the casting molds and cores must be manufactured one by one. This requires a significant amount of labor, and leads to the problem of an increase in the manufacturing cost of the throttle body 11.

SUMMARY OF THE INVENTION

[0008] The present invention was devised in order to solve such problems. It is an object of the present invention to provide an intake passage member which allows die casting or injection molding using a synthetic resin by splitting the part S where the removal of a core is impossible into two members, namely a throttle body 11 and an insulator 12, in cases where there is a bent part in the intake passage.

[0009] In order to achieve the abovementioned object, the present invention is an intake passage member for an internal combustion engine comprising an intake passage main body part which feeds intake air or a mixture into an internal combustion engine, and which is equipped with an intake passage that has a bent part, and an insulator which is interposed between the abovementioned intake passage main body part and internal combustion engine, wherein a portion of the bent part of the abovementioned intake passage is formed in the intake passage of the insulator, and the intake passages of both the intake passage main body part and the insulator are formed with shapes that allow the removal of a core from the mold.

[0010] Furthermore, it is also possible to use a construction wherein the shapes of the respective intake passages that are formed in the abovementioned intake passage main body part and insulator are shapes which are such that when the respective cores that form the respective intake passages are formed with a split structure, these cores can be removed from the mold from both ends of the intake passages, or to use a construction wherein the abovementioned intake passage main body part and insulator are connected by the engagement of a projecting part on one of these parts with a recessed part in the other part.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a sectional view which shows the intake passage member of the present invention attached to an engine;

Fig. 2 is an enlarge sectional view showing the main body of the throttle body;

Fig. 3 shows the insulator; Fig. 3 (a) is a sectional view along line III-III in Fig. 3 (b), and Fig. 3 (b) is a bottom view;

Fig. 4 shows another insulator; Fig. 4 (a) is a sectional view along line IV-IV in Fig. 4 (b), and Fig. 4

(b) is a bottom view; and

Fig. 5 is a sectional view which shows a conventional intake passage member attached to an engine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] An embodiment of the present invention will be described below with reference to the attached figures. Fig. 1 is a sectional view which shows the intake passage member 100 of the present invention attached to an engine 200. The throttle body 110 which is used as the intake passage main body is fastened to the engine 200 via an insulator 120 by means of bolts or the like (not shown in the figures). An intake passage 111 is formed in the throttle body 110, and a throttle valve 115 is mounted in the intake passage 111 so that this throttle valve 115 is free to pivot.

[0013] In the present invention, the thickness of the insulator 120 (i. e., the length in the direction of flow of the intake air) is greatly increased, and the intake passage 121 [of the insulator 120] is bent. Furthermore, the bent intake passage 121 of the insulator 120 and the intake passage 111 of the throttle body 110 are formed into an integral unit, thus forming an intake passage that has a bent part 117 similar to that shown in the conventional example. As a result, the intake passage 111 can be inclined at the same angle θ as that shown in the conventional example.

[0014] Fig. 2 is an enlarged sectional view of the main body 113 of the throttle body 110. In cases where this main body 113 is manufactured by die casting or injection molding of a synthetic resin, a core is used to form the intake passage 111. However, as is shown in Fig. 2, this is formed in a core shape in which the part S that would not ordinarily allow the removal of a core is split approximately in half between an upper-side core 131 and a lower-side core 132. The upper-side core 131 has a stepped cylindrical shape which is formed with a three-step construction in which the diameter [of the core] gradually becomes smaller in the downward direction, but the central axis is straight. Accordingly, this core can be pulled out of the mold in the direction indicated by a following molding. the lower-side core 132 has a bent part, but can be pulled out of the mold by pulling this core in the direction indicated by b.

[0015] Fig. 3 shows the insulator 120; Fig. 3 (a) is a sectional view along line III-III in Fig. 3 (b), while Fig. 3 (b) is a bottom view. The intake passage 121 is also molded by a core when the insulator 120 is molded; however, in this core as well, as is shown in Fig. 3 (a), the part S that would not ordinarily allow the removal of a core is split approximately in half between an upper-side core 141 and a lower-side core 142. The upper-side core 141 has a curved surface, but can be removed by pulling the core in the direction indicated by c in the figure, while the lower-side core 142 can be pulled out in the direction indicated by d.

[0016] Furthermore, when the throttle valve 115 is attached to the main body 113 of the throttle body 110, and the projecting part 122 of the insulator 120 is inserted into the recessed part 116 formed in the lower end of the main body 113, an intake passage that is bent in the same manner as in a conventional member can be formed by the intake passage 111 of the throttle body 110 and the intake passage 121 of the insulator 120. Furthermore, the formation of a step at the joint between the intake passages can be prevented by engaging the projecting part 122 and recessed part 116.

[0017] As is shown in Fig. 3 (b), the insulator 120 has a flange beneath the projecting part 122, and through-holes 123, 123 for bolts or the like are formed in the protruding parts on both sides of the flange. the lower end of the throttle body 110 also has the same shape, and has through-holes (not shown in the figures). These through-holes and the through-holes 123, 123 are superimposed, and bolts or the like are passed through; fastening is then accomplished by screwing these bolts into female screws formed on the side of the engine.

[0018] Fig. 4 shows another insulator; Fig. 4 (a) is a sectional view along line IV-IV in Fig. 4 (b), and Fig. 4 (b) is a bottom view. This insulator 150 has a shape in which an intake passage 152 is formed in the center of a thick disk 151, and a cylindrical part 153 is disposed around the circumference. The intake passage 152 is bent, and this bend can be formed by splitting the core into an upper-side core 161 and lower-side core 162, and pulling the respective cores out in opposite directions. Four slits 154 are formed in the cylindrical part 153. Furthermore, a pipe (not shown in the figures) which is installed in an upright position in the intake passage on the engine side is inserted and connected to the inside of the cylindrical part 153. Moreover, a portion of the thick disk 151 is engaged and connected with a recessed part formed in the throttle body.

[0019] As was described above, the intake passage member for an internal combustion engine provided by the present invention is an intake passage member for an internal combustion engine comprising an intake passage main body part which feeds intake air or a mixture into an internal combustion engine, and which is equipped with an intake passage that has a bent part, and an insulator which is interposed between the above-mentioned intake passage main body part and internal combustion engine, wherein a portion of the bent part of the abovementioned intake passage is formed in the intake passage of the insulator, and the intake passages of both the intake passage main body part and the insulator are formed with shapes that allow the removal of a core from the mold. Accordingly, an intake passage member which has an intake passage that is bent at a desired angle can be manufactured by die casting, injection molding of a synthetic resin, or the like.

[0020] If the abovementioned intake passage main body part and insulator are connected by engaging a projecting part formed on one these parts with a re-

cessed part formed in the other part, the formation of a step at the joint between the intake passages can be prevented.

Claims

1. An intake passage member for an internal combustion engine comprising:

an intake passage main body part which feeds intake air or a mixture into an internal combustion engine, and which is equipped with an intake passage that has a bent part; and an insulator which is interposed between said intake passage main body part and internal combustion engine;

wherein a portion of the bent part of said intake passage is formed in the intake passage of the insulator, and the intake passages of both the intake passage main body part and the insulator are formed with shapes that allow the removal of a core from the mold.

2. The intake passage member for an internal combustion engine according to claim 1, wherein the shapes of the respective intake passages that are formed in said intake passage main body part and insulator are shapes which are such that when the respective cores that form the respective intake passages are formed with a split structure, said cores can be removed from the mold from both ends of the intake passages.

3. The intake passage member for an internal combustion engine according to claim 1 or claim 2, wherein said intake passage main body part and insulator are connected by the engagement of a projecting part on one of the intake passage main body part and the insulator with a recessed part in the other of these.

FIG.1

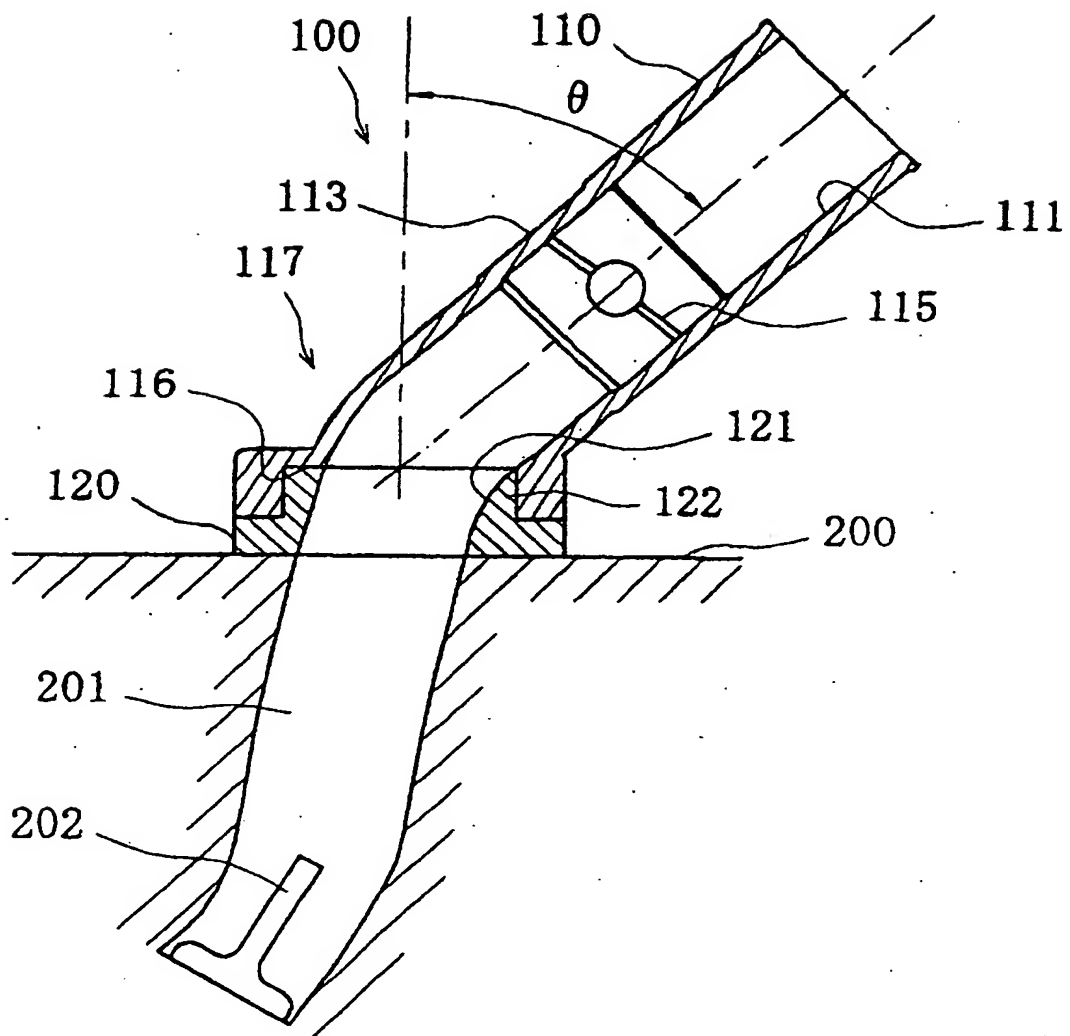


FIG.2

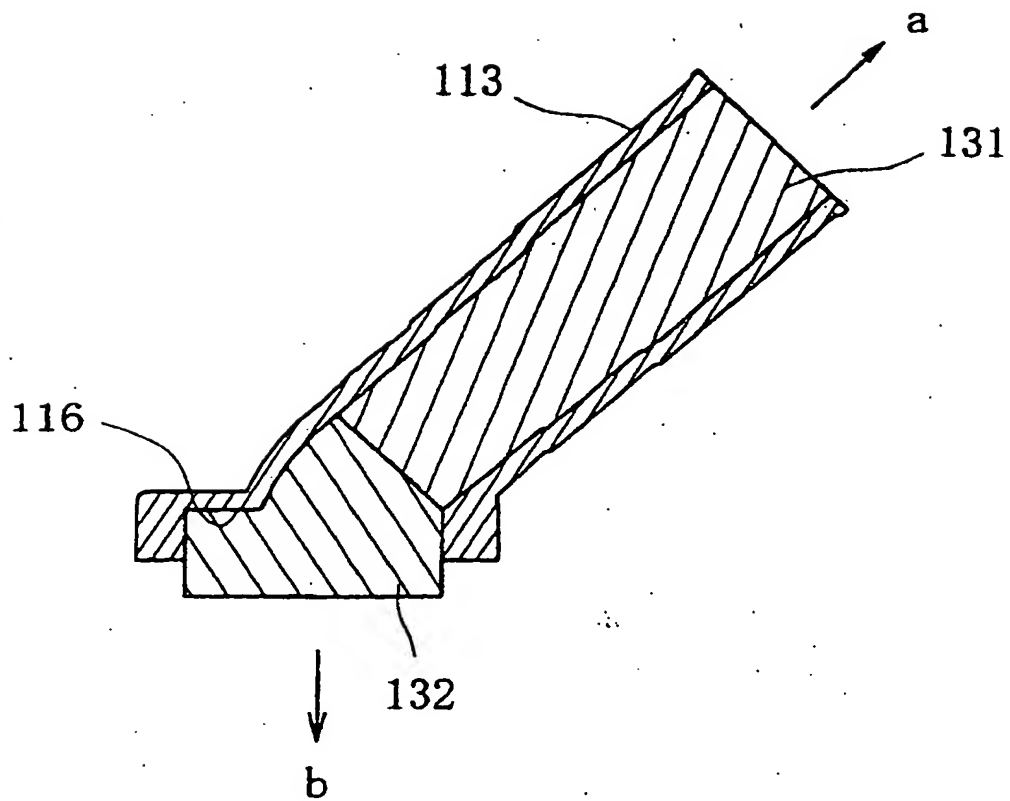
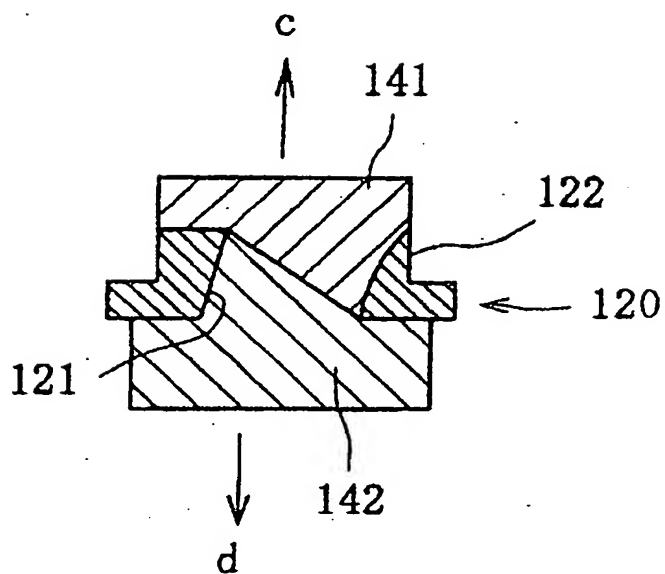


FIG.3

(a)



(b)

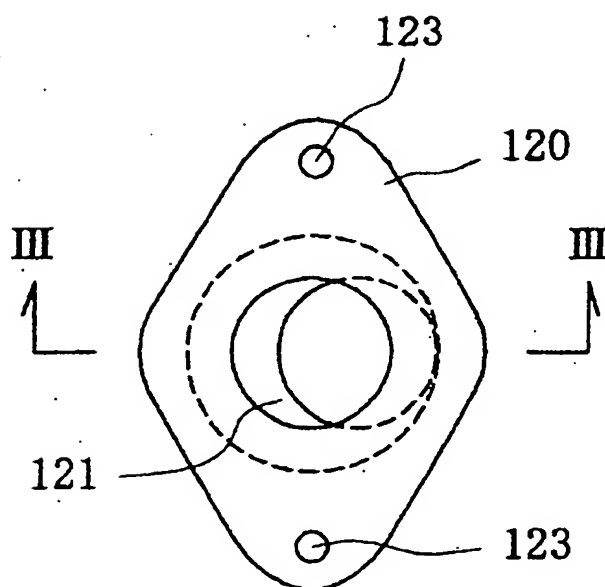


FIG.4

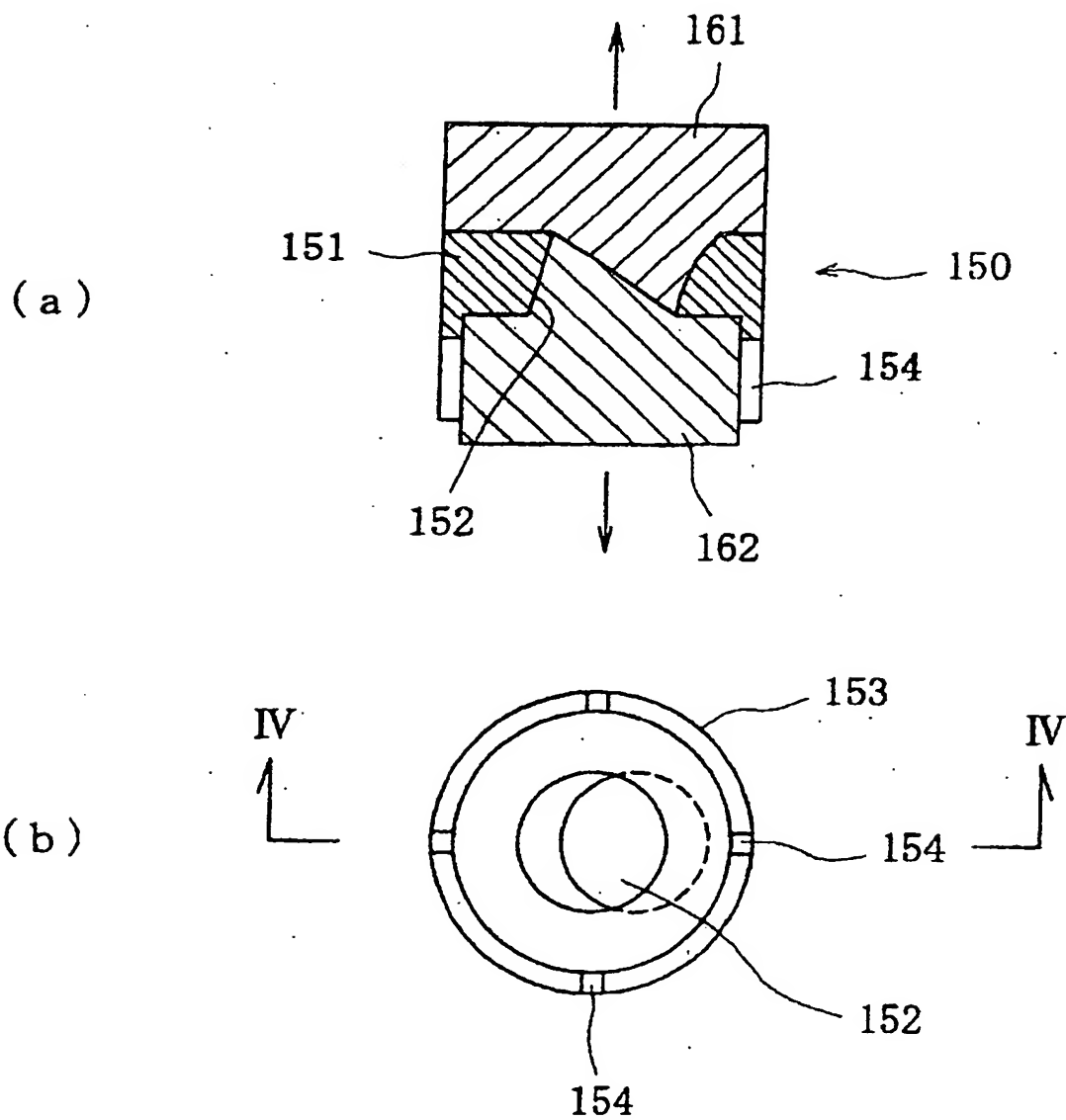
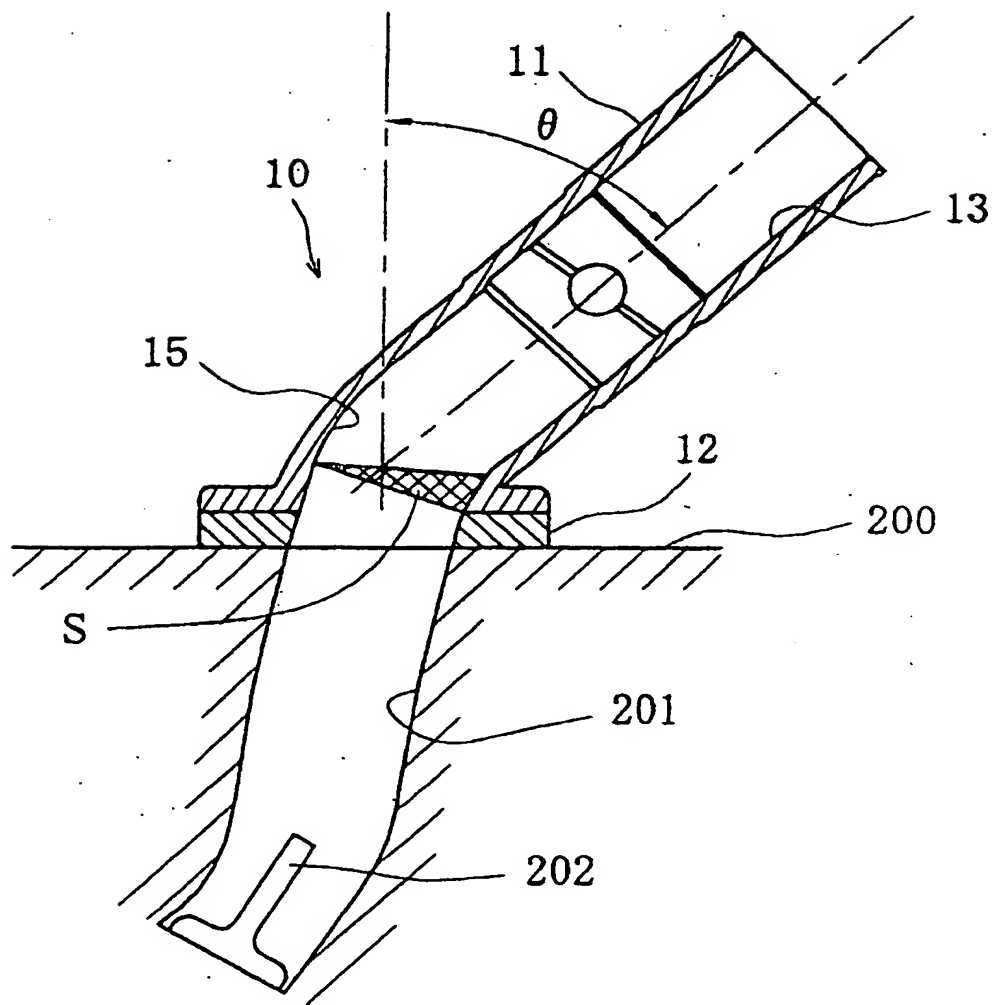


FIG.5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/07745

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ F02M35/10		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl. ⁷ F02M35/10		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 10-299592 A (Honda Motor Co., Ltd.),	1
Y	10 November, 1998 (10.11.98),	3
A	Figs. 5, 7, 8 (Family: none)	2
Y	JP 6-330827 A (Sanshin Kogyo Kabushiki Kaisha), 29 November, 1994 (29.11.94), Fig. 3 (Family: none)	3
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 04 September, 2002 (04.09.02)		Date of mailing of the international search report 01 October, 2002 (01.10.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

Somervell, Thomas R

From: SSP [ssp@epo.org]
Sent: 27 May 2005 14:06
To: Somervell, Thomas R
Subject: RE: Your Ref RS 111897 GB - Our Ref

Dear Mr Somervell,

Please find, attached, the search report.
The confirmation follows shortly.
With best regards,
Robert de Best

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"Somervell, Thomas R" <TSomerve@marks-clerk.com>

26-05-2005 12:13

To: "SSP" <ssp@epo.org>

cc:

Subject: RE: Your Ref RS 111897 GB - Our Ref D072829PGB

Dear Gabriella,

We have still not received any information relating to this search. Please can you let me know if there will be any further delay?

Kind regards

Tom Somervell.

-----Original Message-----

From: SSP [mailto:ssp@epo.org]
Sent: 28 April 2005 10:10
To: Somervell, Thomas R
Subject: Re: Your Ref RS 111897 GB - Our Ref D072829PGB

Dear Ms Somervell,

Thank you for your email dated the 26 April 2005.

We regret to inform you that the search results for the above mentioned case have been delayed, due to the workload in the technical department. The search report can be available by the 20 May 2005.

Please indicate by return if you accept this.

27/05/2005



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Aktenzeichen/File No./No. du Dossier

RS 111897 GB

Datum/Date

Das Europäische Patentamt übermittelt hiermit den Standardrecherchenbericht zu dem unten bezeichneten Antrag; Kopien der im Recherchenbericht angeführten Schriften werden in der Anlage beigelegt.

The European Patent Office herewith transmits the Standard Search Report relating to the request indicated below; copies of the documents cited in the search report are enclosed.

L'Office Européen des Brevets à l'honneur de vous transmettre ci-joint le Rapport de Recherche concernant la demande désignée ci-dessous; des copies des documents cités sont jointes.

Zeichen und Datum des Antrages Applicant's reference and date Références et date de la demande	D072829 PGB
Dokument, Gegenstand der Recherche Document subject of the search Objet de la recherche	GBA 0414600
Einreichungstag Filing date Date de dépôt	30/06/2004
Beanspruchte Priorität Priority claimed Priorité revendiquée	

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Pour le Vice-Président,

R. de Best



European Patent
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STANDARD SEARCH REPORT

File
RS 111897
GB 0414600

DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US 3 073 776 A (TURNER DELBER W) 15 January 1963 (1963-01-15) * claims 1-13 * * column 2, line 10 - line 26 * * column 2, line 39 - line 66 * * column 4, line 3 - line 26 * * figure 1 *	1,2,4, 12,13, 19,22,23
A	US 5 080 779 A (AWBREY ET AL) 14 January 1992 (1992-01-14) * claim 1 * * column 3, line 65 - column 4, line 48 *	1,2,6, 9-14, 16-18
A	WO 97/29169 A (PHILLIPS PETROLEUM COMPANY; MITCHELL, KENT, EDWARD) 14 August 1997 (1997-08-14) * claims 1,9,11 * * page 7, line 7 - line 13 *	1,6, 10-14, 16-18
		TECHNICAL FIELDS SEARCHED (Int.CL.7)
		C10G
The present search report has been drawn up for all claims		
Date of completion of the search 27 May 2005		Examiner De Herdt, 0
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

ANNEX TO THE STANDARD SEARCH REPORT NO.

RS 111897
GB 0414600

This annex lists the patent family members relating to the patent documents cited in the above-mentioned search report.
The members are as contained in the European Patent Office EDP file on
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27-05-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3073776	A	15-01-1963	NONE
US 5080779	A	14-01-1992	NONE
WO 9729169	A	14-08-1997	US 5746908 A 05-05-1998
		AU 1696097 A 28-08-1997	
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